



Managing invasive
species impacts – feral
animals and weeds

Talk presented to weed and
feral animal control rangers
at Kakadu National Park
(4 April 2003)

P Bayliss & D Walden

June 2003

Managing invasive species impacts – feral animals and weeds

**Talk presented to weed and feral animal control
rangers at Kakadu National Park (4 April 2003)**

By Peter Bayliss & Dave Walden

Environmental Research Institute of the Supervising Scientist

Registry File #



Seminar outline

Principles of population control to mitigate damage

Using integrated 'Pest Control' models

Damage-density relationship

Cost-of-control curve

Population growth response

Examples

Pigs on Kakadu

Buffalo on Kakadu

Mimosa on Oenpelli

Management & monitoring framework for invasive species

Managing invasive species impacts (ferals & weeds)



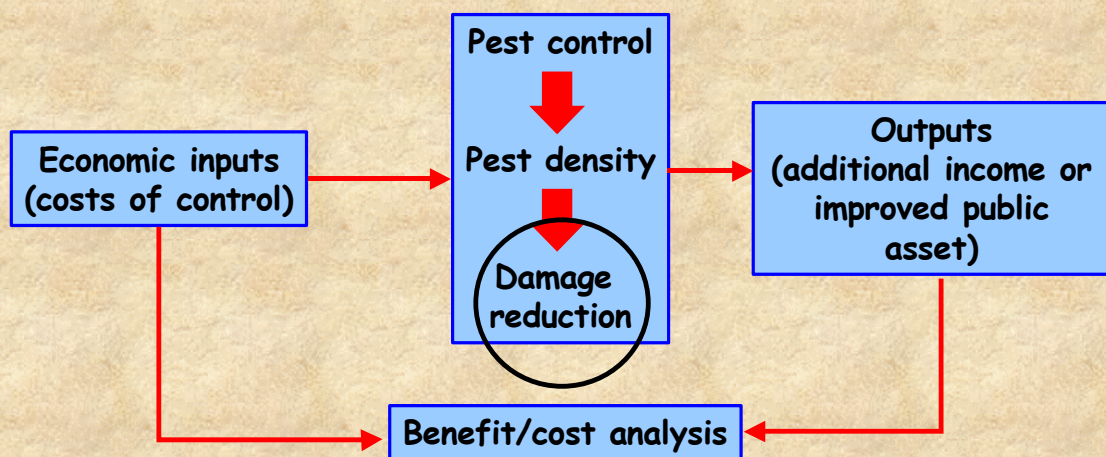
THE 3 “TRUTHS” OF POPULATION CONTROL

- All animals have an **impact** on their environment.
- **Damage** occurs when that **impact** causes economic or environmental **harm**.
- How one defines “**harm**” depends on how one makes a living.

Managing invasive species impacts (weeds & ferals)

- Involves making choices
 - how much management intervention at what cost (\$) ?
 - what benefit is delivered ?
- Challenge is to make choices that are
 - sensible
 - pragmatic
 - defensible
- Requires benefits & costs to be balanced at least
 - past focus on “activity-based” management
 - need new focus on “damage-based” management within a budget
 - involves complex decision making - need to use modelling tools

Pest Control Modelling



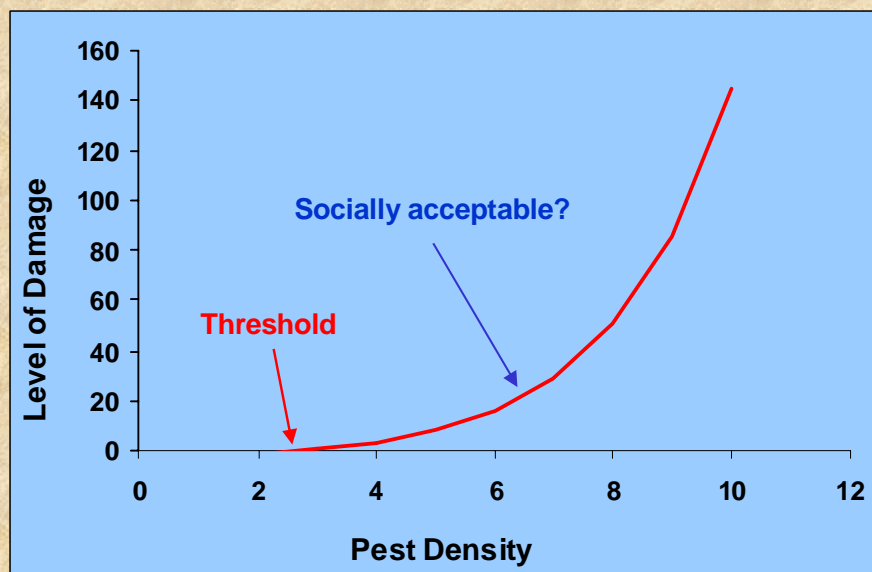
Monetary benefit/cost analysis
Benefit maximisation
Cost minimisation

POPULATION CONTROL

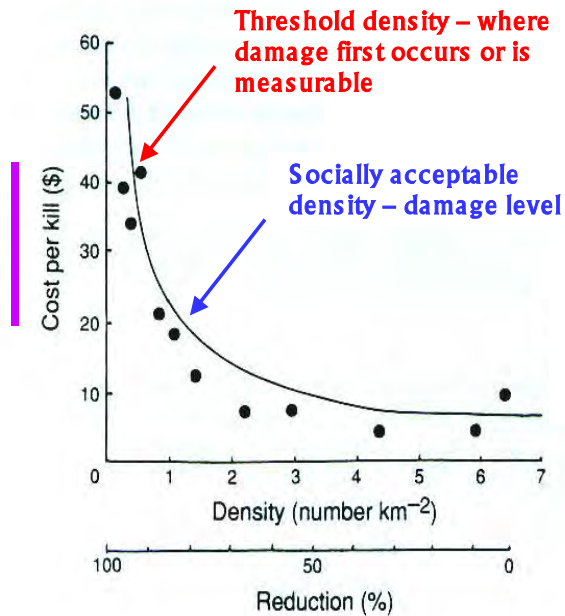
HOW TO MANAGE IMPACTS OR “DAMAGE”

- Clearly define damage in first place
- Identify a socially acceptable level of damage & corresponding animal density
- Use modelling tools to improve efficiency of control operations within budgetary constraints – i.e. come up with the hard facts & figures
- There are only 3 key models to use

1. DAMAGE - DENSITY RELATIONSHIP

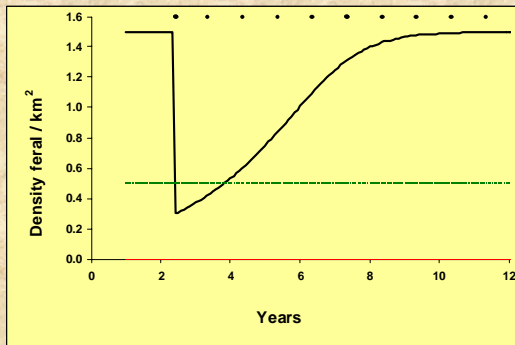


2. COST- OF- CONTROL CURVE CHOOSING THE RIGHT “TARGET” DENSITY

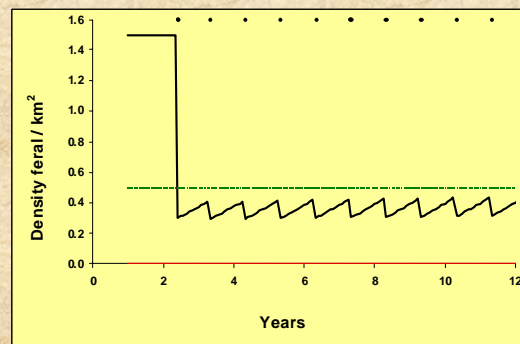
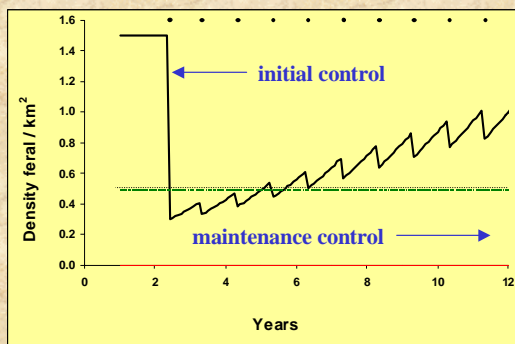


Buffalo – Arnhem Land
1985

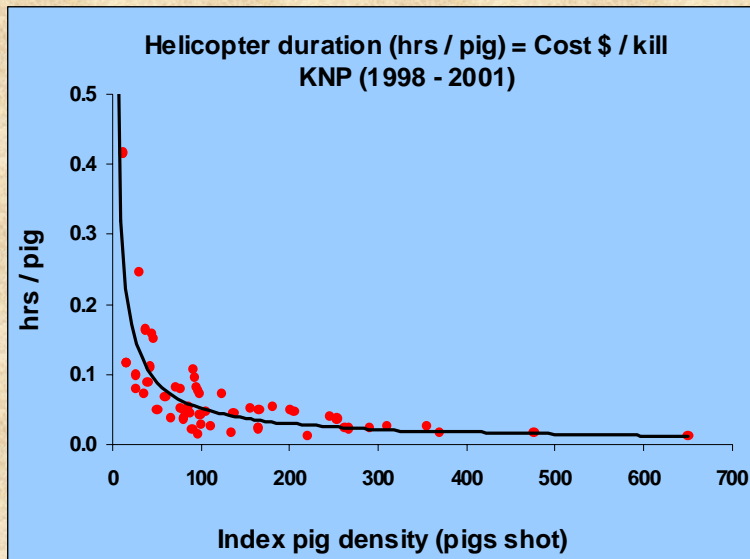
3. POPULATION GROWTH RESPONSE



RECOVERY RATE
(usually rapid with pest species)



PIG CONTROL – KAKADU – COST CURVE



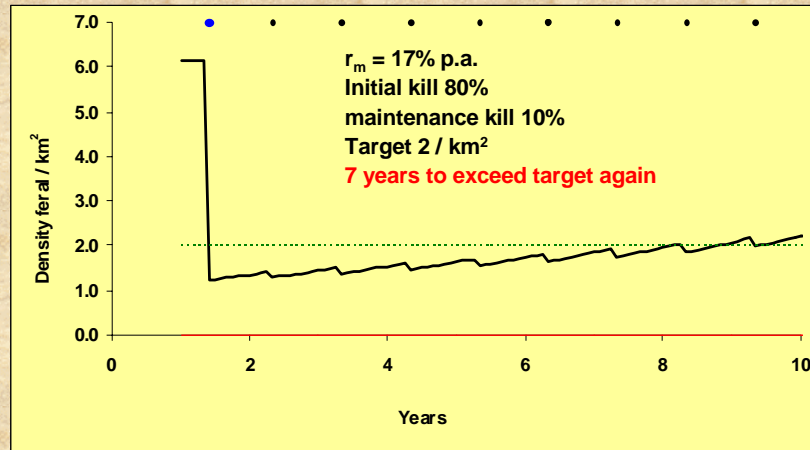
NB: Still need to add all other costs – ammo, salary etc
Index density needs to be converted to “actual density”

NTU KCTWM FERAL ANIMAL MANAGEMENT CONTRACT KAKADU



- How do Traditional Owners view this “damage”?
- How do they value pigs & buffalo?
- Which cultural resources (assets) are being damaged or at risk? (habitats, species, sacred sites etc)
- How many & where (whose country & responsibility)?
- How do we manage these different views? - what are the “trade-offs”?

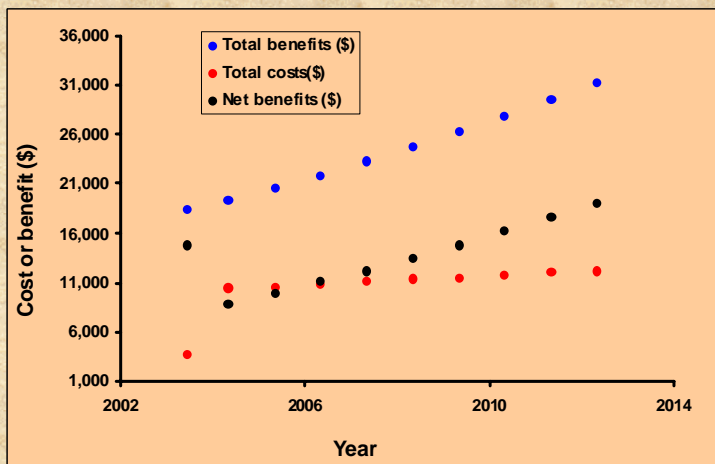
SIMULATED BUFFALO CONTROL monitoring performance



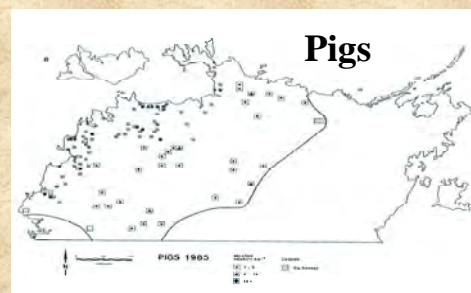
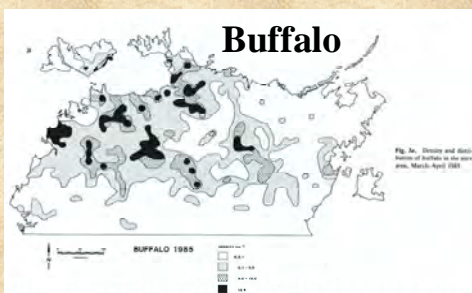
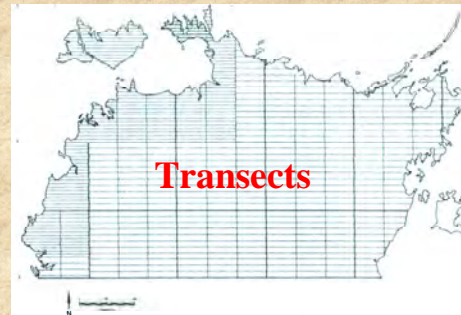
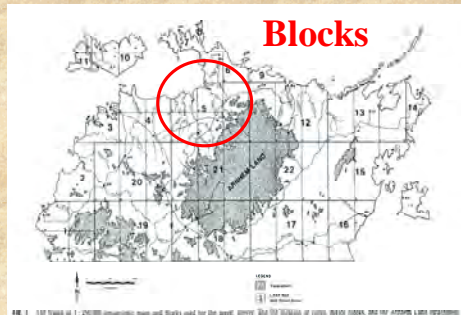
COST-OF-CONTROL OR HARVEST / HABITAT		
	Costs / km ² / yr	Total \$
Initial cost	\$36.91	\$3,691
Maintenance cost	\$113	\$101,709
Total cost for 10 Years		\$105,400

SIMULATED BUFFALO HARVEST

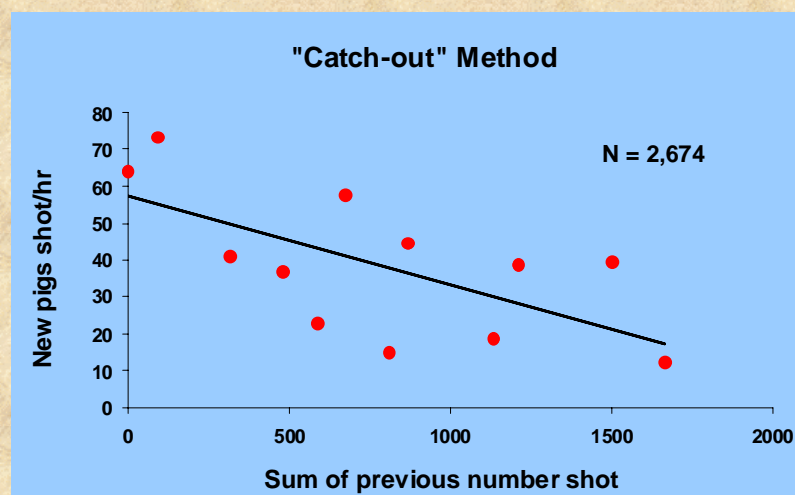
For BUFFALO	
Year start	2003
Year end	2023
Simulation Years	10
Price \$/head	\$150.0
Total Return	\$243,245
Total Cost	\$105,400
Net cost or benefit	\$137,845
Net annual Return	\$13,785 p.a.
Total annual cost	\$10,540 p.a.
\$ cost helicopter/hr	\$1,000



But we also need current information on feral animal distribution & abundance – many methods e.g. aerial survey (Bayliss 1985)



**Or use methods related directly to control program
e.g. Catch-out fisheries method (Pigs – 1999 Kakadu)**



More cost effective – but requires CONSISTENT collection of the RIGHT sort of effort data (time spent searching & killing in an AREA; # killed, # bullets/kill)

RULES OF ENGAGEMENT OF PEST CONTROL

- Keep focused on **damage management**, not numbers killed
- **Searching** an area is just as important as killing – e.g. 2 pigs killed in a high priority control area (with threatened habitat) is more important than a 1,000 pigs killed in a low priority area.
- A reduced population will quickly recover – control is “forever” - so need a **cost-effective** maintenance program using the best kill proportion & time interval to keep density below target (e.g. 30% of what's left every 2 years).
- So absolutely essential that you collect consistent effort & cost data for each control area, to **monitor** your performance in relation to DAMAGE control.

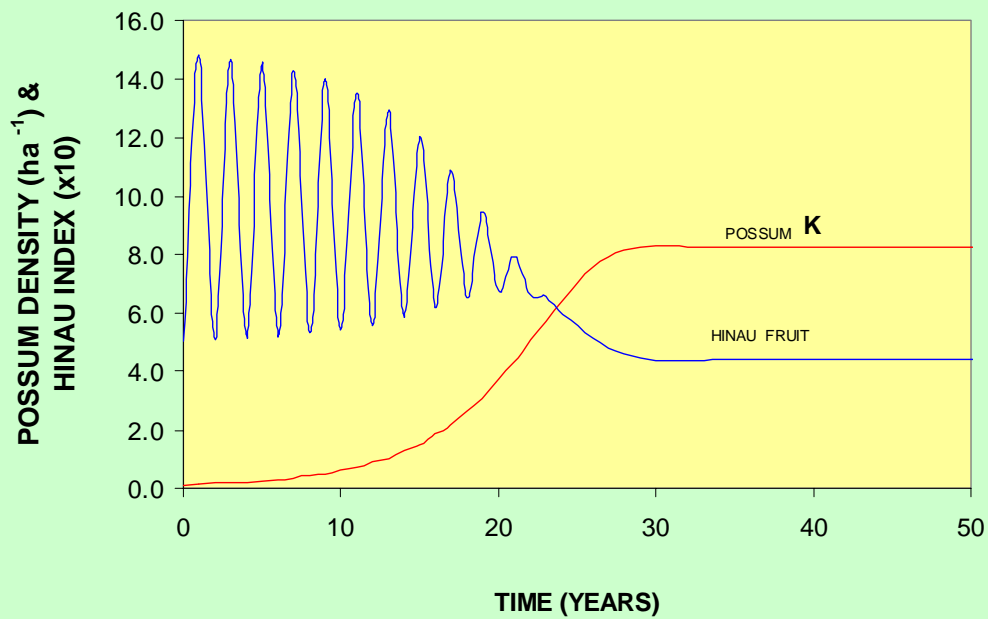
Pig impacts on Eleocharis

PhD student Robert Bednarik – NTU
supported by TOs, Parks & Eriss

Eleocharis dulcis -Bunda



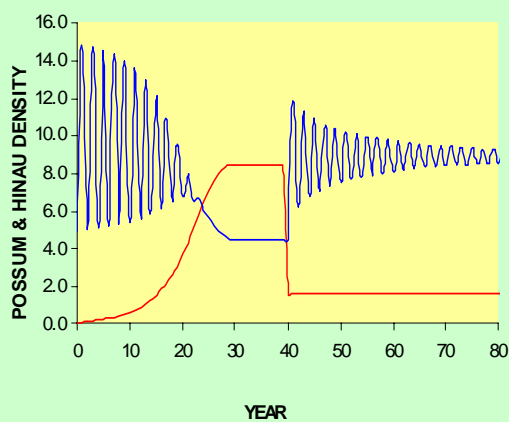
Introduced possum in NZ & damage to native forests



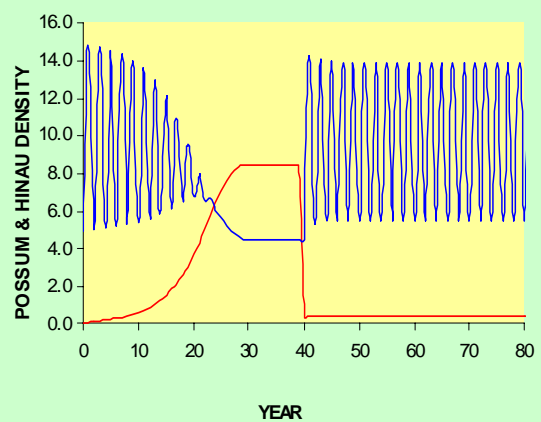
DENSITY- DAMAGE THRESHOLD

What target density is needed to restore natural “masting” cycle in hinau fruit production?

Target = 80% reduction



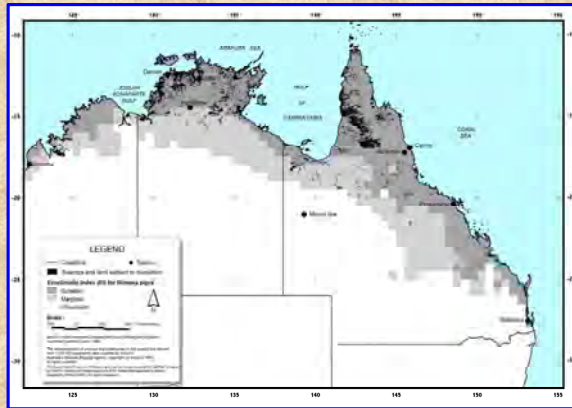
Target = 10% reduction



— Possums Hinau —

Mimosa Risk Assessment northern Australia

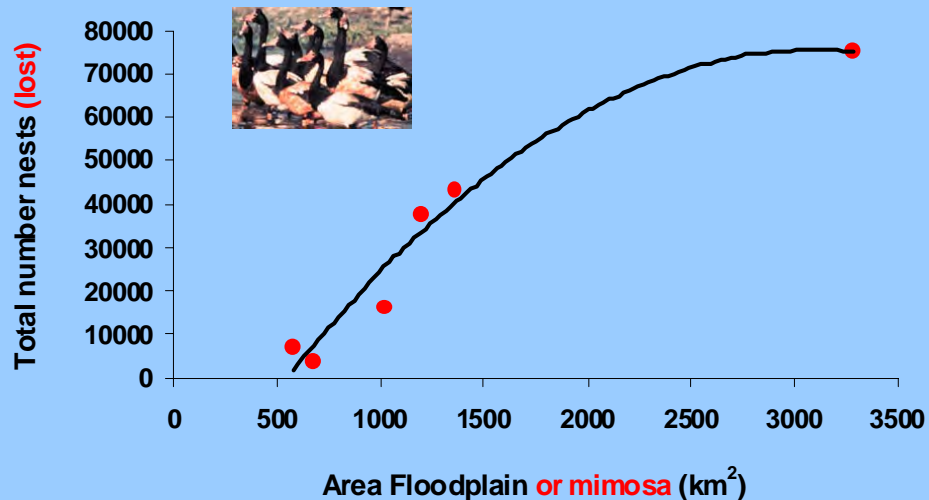
Dave Walden *et al.* (2002): A Risk Assessment of the Tropical Wetland Weed *Mimosa pigra* in Northern Australia



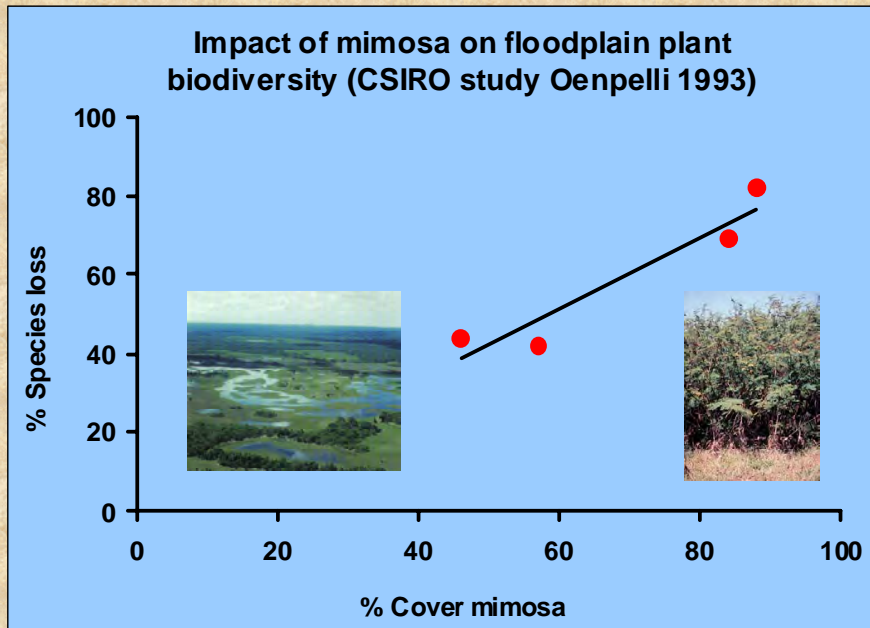
Wetlands across northern Australia potentially at risk of mimosa infestation, based on 1:250K topographical wetland data & potential distribution using CLIMEX

POTENTIAL DAMAGE CAUSED BY MIMOSA TO WATERBIRDS

Potential impact mimosa on magpie geese nest numbers in Top End (1983-1989)



DAMAGE CAUSED BY MIMOSA TO WETLAND PLANT DIVERSITY



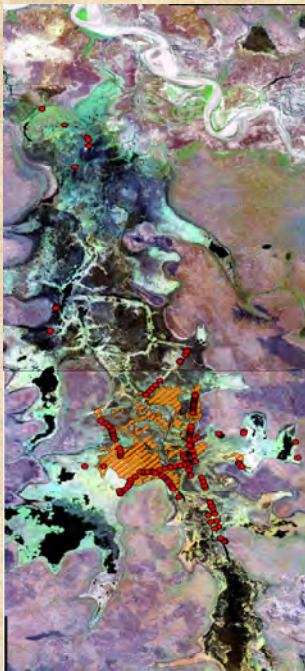
MIMOSA & PARAGRASS DESTROYS BUSH TUCKER HARVESTS



& ANY POTENTIAL FOR COMMERCIAL USE



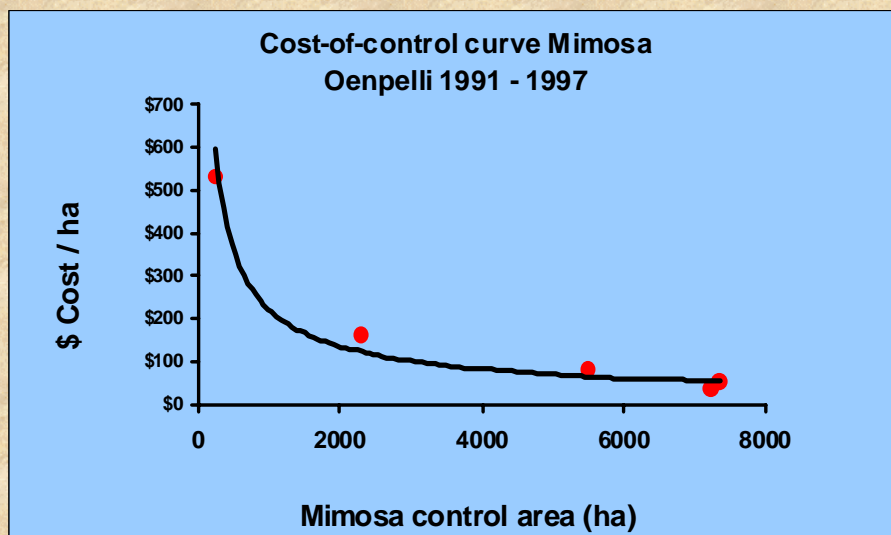
Mapping Paragrass & other weeds on the Magela



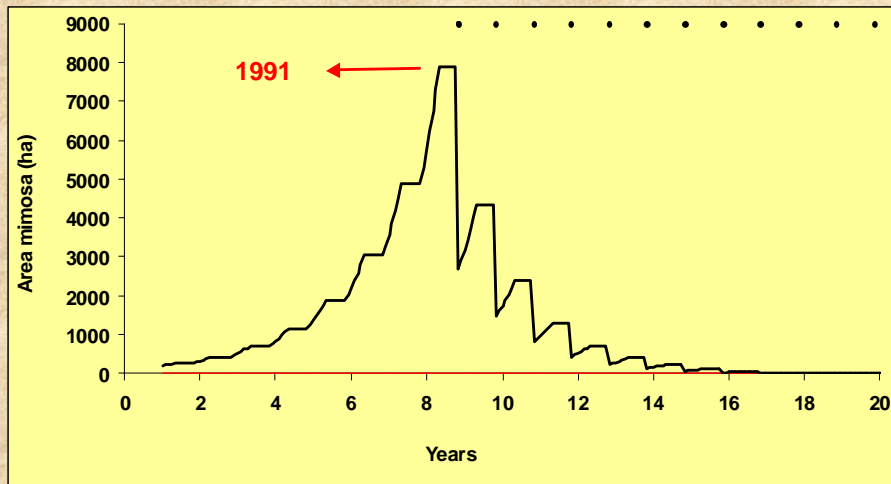
New (2003)
Old (1991)



Mimosa control on Oenpelli Floodplain



MIMOSA CONTROL OENPELLI (1991 – 1997)

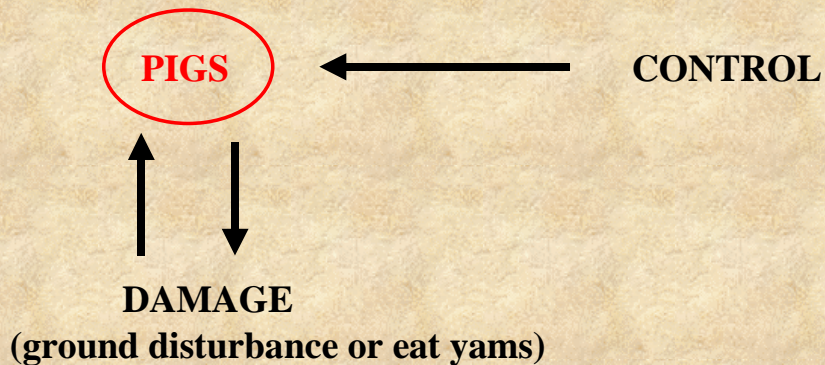


	Costs/ha	Total Costs
Initial cost (\$/ha)	\$51	\$404,162
Mean annual maint cost (\$/ha/yr)	\$218	\$247,707
Total cost (\$/ha) for	\$1,139	\$1,642,696

ABUNDANCE MANAGEMENT FRAMEWORK

ABUNDANCE APPROACH

Dominates pest control, is a single species, single method & single location approach - inefficient



IMPACT MANAGEMENT FRAMEWORK

DAMAGE APPROACH

Focus is on the "damage", not the animal; allows use of social & economic values in management decisions - more efficient & realistic

